1   UNITED STATES DISTRICT COURT

2   NORTHERN DISTRICT OF CALIFORNIA

3   SAN FRANCISCO DIVISION

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5   ------------------------

6   ORACLE AMERICA, INC.,   )

7   Plaintiff,   )

8   vs.   ) No. CV 10-03561 WHA

9   GOOGLE, INC.,   )

10   Defendant.   )

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12

13   ATTORNEYS' EYES ONLY

14

15   Videotaped Deposition of EREZ LANDAU,

16   taken at 42 Chauncy Street, Boston,

17   Massachusetts, commencing at 9:50 a.m.,

18   Wednesday, September 14, 2011, before

19   Jill Shepherd, RPR, MA-CSR No. 148608,

20   NH-CSR No. 128, CA-CSR No. 13275, CLR,

21   Notary Public.

22

23

24

25   PAGES 1 - 113

Attorneys' Eyes Only

1 used the skeleton. It was one of them, but	1 Q. 35,000 shekels a month?
2 I don't remember which one. It was just for	2 A. Yes.
3 form to fill out my stuff to give it the	3 Q. It is about 3.7 shekels per dollar
4 same format.	4 approximately; is that correct?
5 Q. You didn't review the content of	5 A. That's 3.5 and 3.7 depending on the day of
6 Mr. Vandette or Mr. Poore's reports?	6 the week.
7 A. Not technically.	7 Q. Do you own any Oracle stock or options?
8 Q. Is Oracle paying you anything in addition to	8 A. A few.
9 your regular salary for working on this	9 Q. Do you know approximately how much?
10 case?	10 A. Around $2,000 worth.
11 A. No.	11 Q. What kind of phone do you use?
12 Q. Approximately how many hours or days have	12 A. iPhone.
13 you spent on this case?	13 Is it possible to get some more water?
14 A. Hours, it's about 100 or 200. Not including	14 (Pause.)
15 this week. This week jump it up.	15 (Exhibit 488 marked.)
16 Q. Is your involvement in this case officially	16 Q. To make things official, have you seen this
17 part of your job responsibilities?	17 notice before?
18 A. It's approved by my manager, but it's not	18 A. (Witness reviewing document).
19 part of my job responsibility.	19 No.
20 Q. Have you in the past performed any work for	20 Q. Okay. Exhibit 488 is just a notice of your
21 other litigations --	21 deposition.
22 A. No.	22 Have you been informed that you are
23 Q. -- involving Oracle or Sun?	23 here today to testify as an employee of
24 A. No.	24 Oracle regarding matters in this case?
25 Q. Do you have any patents on Java-related	25 MR. PETERS: Objection. Form.
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1 technology?	1 A. Yes.
2 A. Yes.	2 (Exhibit 489 marked.)
3 Q. How many?	3 Q. Exhibit 489 is a copy of U.S. patent number
4 A. Well, I submitted four. I think only one is	4 7,426,720, which I will refer to as the '720
5 finished on the line, on the way, fully	5 patent.
6 approved, but four submitted.	6 Have you reviewed the '720 patent
7 Q. One patent issued and --	7 before?
8 A. Four patents issued, one of them was	8 A. Partially.
9 approved. They are in process still. It	9 Q. What do you mean by "partially"?
10 takes several years.	10 A. I did not read it start to end, only
11 Q. What are those patents generally about?	11 specific.
12 A. Most of them are related to memory usage and	12 Q. What specific portions did you review?
13 class loading and fast startup. The same	13 A. The abstracts, and then part of the claims,
14 area -- very close area to the '720 patent.	14 especially claim number one.
15 Q. Do you get any bonus or award for submitting	15 Q. You did not -- let me rephrase.
16 patent applications?	16 Did you review the figures in the
17 A. Yes.	17 patent?
18 Q. How much?	18 A. No.
19 A. $2,000 per patent.	19 Q. Did you review --
20 Q. Do you have any financial interest in the	20 A. I would look at them. I'm familiar with
21 outcome of this litigation?	21 them. That's why I did not bother to...
22 A. No.	22 Q. Did you read through the specification of
23 Q. What is your salary?	23 the patent, the general discussion?
24 A. 35,000 dollars -- shekels. Shekels, it's	24 A. Not in this form. I was reviewing it when
25 Israeli currency.	25 it was submitted, sometime after it's been
Page 19	Page 21

6 (Pages 18 - 21)

Attorneys' Eyes Only

1   submitted. But in the final form? No.
2   It's not always the same.
3 Q. Do you mean you were reviewing a draft of
4   this patent?
5 A. Yes.
6 Q. Do you know which claims of this patent are
7   asserted in this case?
8 A. I was told. I don't remember by heart.
9 Q. Did you review Oracle's infringement
10   contentions for this patent?
11 A. No. I think I was asked about it.
12 Q. What is this patent about?
13   MR. PETERS: Objection. Form.
14 A. It's about the usage of copy-on-write
15   mechanism cloning for the benefit of fast
16   and efficient memory class loading and other
17   stuff.
18 Q. What functionality in Android is accused of
19   infringing this patent?
20   MR. PETERS: Objection. Form.
21 A. Zygote.
22 Q. How do you know what functionality was
23   accused in this case?
24 A. I looked into zygote code and I can find the
25   code that relate to this. I am very
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1   being duplicated via the process of the page
2   table, TBL, and after that point in the
3   process is created in the schedule, and that
4   the entire page table is identical.
5   Page table is what translates from virtual
6   addressing into physical addressing, and the
7   result of it is you have two processes with
8   the exact same identity, the same thought,
9   same recollection, same memory, same state
10   exactly.
11   And after this point, they are going
12   their own separate ways, but the cloning is
13   same state, not just the application. Once
14   they start to go their own ways, there is
15   the technique, all the memory they are
16   referencing is -- the read-only, and when
17   they try to touch it, modify it, they get an
18   exception automatically. This page has been
19   copied, and you get your own private copy of
20   it.
21   This is why it's also called
22   copy-on-write. Copy-on-write is just a
23   nickname for the entire process of cloning
24   via fork. This is the phenomenon and this
25   technique is used for fast saving and faster
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1   familiar with Sun's special implementation
2   of this patent and I was looking for
3   something similar.
4 Q. Did you perform that analysis independently
5   of Oracle's attorneys?
6 A. Attorneys? Yes. I was consulting with
7   John Mitchell. I was consulting with him.
8 Q. Did he tell you what to look at?
9 A. We agreed upon -- what we agreed upon is
10   that copy-on-write is an essential part of
11   this patent and must be disabled in order to
12   disable this patent, and also we agreed that
13   once we disable copy-on-write, all the other
14   parts are disabled, so it's efficient to
15   disable this entire patent by disabling
16   copy-on-write. So disable this entire
17   patent by disabling of copy-on-write. So
18   disable of copy-on-write is a must and
19   sufficient.
20 Q. What is copy-on-write?
21 A. The long version is two days, the short
22   version is one hour. I will try to do it.
23   It's pretty complicated.
24   Copy-on-write starts with fork in
25   which the entire image of an application is
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1   startup and memory saving in general, but
2   there is much more.
3 Q. When was this technique developed?
4 A. 1980 plus once a year [sic]. 1979 or to
5   1981, but I think it's 1980, plus one --
6   plus/minus one year.
7 Q. Was it implemented in operating systems like
8   UNIX?
9 A. It was implemented only in UNIX, not "like."
10 Q. Is it in Linux?
11 A. Everything from Unix is in Linux as well.
12 Q. Were there virtual machines that used it?
13 A. Yes. CVM, but CVM was the first one, and
14   then Android was the only one.
15 Q. Are you familiar with the Perl virtual
16   machine?
17 A. Which?
18 Q. Perl.
19 A. No.
20 Q. Which Oracle products use it? Let me
21   rephrase.
22   Which Oracle products use
23   copy-on-write?
24   MR. PETERS: Objection. Form.
25 A. I told you, CVM.
Page 25

7 (Pages 22 - 25)

1 Q. Turning to page four, paragraph 18, you say,
2   "We selected a single production phone."
3   Who is "we"?
4 A. I would say me and Seeon, and also
5   John Mitchell.
6 Q. And you tested two Nexus One phones; is that
7   correct?
8 A. Yes.
9 Q. You had two separate phones; is that
10   correct?
11 A. Yes.
12 Q. Did Oracle send those phones to you in
13   Israel to test?
14 A. I had them before.
15 Q. Paragraph 19, you say, "Memory consumption
16   is not expected to vary between phones" and
17   "startup time is expected to stay
18   proportional to other timing on the phone";
19   is that correct?
20 A. Yes.
21 Q. Do all phones have the same amount of
22   memory?
23 A. No.
24 Q. Do you know how Android manages memory?
25 A. It's very -- it's too open a question.

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1 A. To the best of my knowledge; and it's not my
2   expertise, no.
3 Q. To the best of your knowledge, some phones
4   may have a faster processor than other
5   phones; is that correct?
6   MR. PETERS: Objection. Form.
7 A. Yes.
8 Q. Would it make sense that faster processors
9   can result in a faster startup time?
10   MR. PETERS: Objection. Form.
11 A. There is a general trend in the market to
12   use faster and stronger and more powerful
13   and more memory capacity devices, and on the
14   other end to use more and more software,
15   demands more performance, more memory, and
16   more stuff to do at startup, so your device
17   is always too slow and you never have enough
18   memory.
19 Q. But if you are using the same software --
20   MR. PETERS: Objection. Form.
21 Q. -- would a faster processor run that
22   software faster?
23   MR. PETERS: Objection. Form.
24 A. As a customer of phones, I will use the
25   cheapest phone that can run my set of

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1 Q. Do you understand that if a phone has less
2   memory, Android may have to be more
3   aggressive in clearing out memory to make
4   space available --
5 A. Yes.
6 Q. -- for new applications?
7 A. Sorry. It will clear application that's not
8   in use if it's scarce on memory.
9 Q. And if an Android-based device has more
10   memory, it has the flexibility to leave more
11   data and code in memory; is that correct?
12   MR. PETERS: Objection. Form.
13 A. More data and code? I cannot relate to this
14   definition. It's somewhat wrong
15   technically.
16 Q. What I'm asking is if there's more memory on
17   an Android-based device, it may consume
18   memory differently than on an Android-based
19   device that has less memory; is that
20   correct?
21   MR. PETERS: Objection. Form.
22 A. It's hard to say yes or no. It depends.
23 Q. Do all Android-based devices have the same
24   processor?
25   MR. PETERS: Objection. Form.

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1   software. I won't waste money to make it
2   faster if I can use a cheaper one, but...
3 Q. When was the Nexus One phone released?
4 A. I don't remember.
5 Q. If I told you it was released in
6   January 2010, would that make sense?
7 A. I don't know. I didn't follow the initial
8   declaration of it.
9 Q. Why did you test the Nexus One phone?
10 A. Available.
11 Q. In other words, you were able to get the
12   phone to test?
13 A. Yes.
14 Q. Was the Nexus S phone enabled?
15 A. To me, this one was available. It was a
16   good enough representative and Google can
17   try it on any other phone they like.
18 Q. When you say "available," do you mean
19   available to you in Israel?
20 A. Yes.
21 Q. Is the Nexus S phone available in Israel?
22   MR. PETERS: Objection. Form.
23 A. Maybe. I didn't check. I'm not an Android
24   fan. You can ask me about my iPhone. I
25   will know better.

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11 (Pages 38 - 41)

1   and it's a big advantage. When you are
2   doing the implicit sharing, you have to do a
3   lot of preparation, a lot of work. It's a
4   very difficult technique, very complex to
5   implement it, and it can be done on a very
6   specific location and very specific way.
7   You have to develop extra technique, which I
8   describe in my patent. So to do just simply
9   this way, it's not simple at all. It's one
10   of the most complicated patents I was
11   working on.
12 Q. How long has shared memory been a computer
13   technique?
14 A. Since for Fordtran in '64, I think, '65.
15 Q. Shared memory has been around for a while
16   then?
17 A. It is a different shared memory than what
18   you are thinking about today, shared memory.
19   It's way different. It's almost like saying
20   that television is around for the last
21   50 years. It's not the same.
22 Q. In paragraph 28, you say, "All workspaces
23   were compiled and loaded to the device"; is
24   that correct?
25 A. Yes.

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1   will do it. But this is why you get help.
2   (Exhibit 491 marked.)
3 Q. Exhibit 491 is a printout from the Android
4   Web site.
5   Have you ever seen this before?
6 A. I think it's a reference that I was giving.
7   I'm in our -- it looks like it. I'm not
8   sure. You have to be more precise. Let me
9   see. (Witness reviewing document).
10   It looks similar. I cannot say for
11   sure. If you tell me it's the same
12   reference that I have given, then it's okay.
13   But I'm not sure.
14 Q. It is.
15 A. So, okay. So it's the
16   source.android.com/source/initilizing.html.
17   It's this.
18 Q. Did you use a Linux machine or a Mac machine
19   to test the phones?
20 A. Linux.
21 Q. Which version of Linux?
22 A. Ubuntu.
23 Q. Which version of Ubuntu?
24 A. Not sure.
25 Q. Did you install the JDK onto Linux?

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1 Q. Did you do that yourself?
2 A. No.
3 Q. Who did that?
4 A. Seeon. I supervised him.
5 Q. What do you mean you supervised him?
6 A. In most cases I was standing next to him.
7 Q. Why did he do it?
8 A. He's more familiar with the Android SDK
9   techniques. If I would do it, it would take
10   me four times the time than it is taking
11   him. Sometimes he is just more familiar
12   with the issues. And besides, his time is
13   less valuable.
14 Q. We'll be sure to ask him if he has the same
15   opinion.
16 A. He got less salary. And, normally, I was
17   supervising for the first time he was doing
18   it, and the second and third and fourth time
19   he was doing it, he was doing it alone, and
20   I was just making sure it was okay. There
21   was many, many executions so I was just
22   supervising the first time making sure it's
23   correct. Then he can repeat the process
24   again and again. He can repeat the process
25   again and again. If it was just one time, I

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1 A. I installed the JDK onto Linux, but not for
2   this testing that was done. It was done by
3   Seeon. And it was easy installation. I was
4   doing installation separately.
5 Q. What installation did he -- of JDK did he
6   put on?
7 A. It's written over here in the instructions.
8   We took the entire repo. It's page six, the
9   beginning. For the instructions, page six.
10 Q. I understand that. But I want to understand
11   the build environment that you created to
12   build Android. So you indicated that you
13   put on the Ubuntu version of Linux.
14   Did you put on the Oracle JDK or open
15   JDK onto Linux?
16 A. Yes, as instructed.
17 Q. Do you know which version of JDK?
18 A. Six. What was available then. It's not so
19   important.
20 Q. JDK6?
21 A. Yes.
22 Q. Did you do this before you downloaded the
23   Android code?
24 A. I don't remember. It's not important. If
25   you do it after or before, it's the same

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16 (Pages 58 - 61)

1   result.
2 Q. Did you install all the packages that this
3   Web site says to install on Linux?
4 A. I think -- I'm not sure.
5 Q. You see on the bottom towards the bottom of
6   the page, it has an S-U-D-O, sudo
7   add-apt-get, then a list of a whole bunch of
8   packages.
9   Are you saying you are not sure if
10   these were installed?
11 A. Well, I'm sure what was written here was
12   installed. I am not sure those composed of
13   everything. I'm sure this was written and
14   this is what was done, but you are asking me
15   a different question.
16 Q. Your report doesn't say -- only says that
17   you downloaded the Android source code.
18   I'm --
19   MR. PETERS: Objection. Form.
20 Q. Is that correct?
21 A. It's ambiguous.
22 Q. What's ambiguous?
23   MR. PETERS: Objection. Form.
24 A. Saying just the Android itself -- what is
25   written over here is correct [indicating],

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1   and it's full of detailed instructions and
2   long ones and...
3 Q. Paragraph 28, you say, "All workspaces were
4   compiled and loaded to the device following
5   the directions described at Google's Web
6   site."
7 A. Yes.
8 Q. You testified that Seeon was the one who
9   actually did that; is that correct?
10 A. Yes.
11 Q. And I'm asking if whoever did it followed
12   the specific directions on Android's
13   Web site or not.
14 A. Correct.
15 Q. So I am asking you if all these packages
16   that it says should be installed were
17   installed on Linux?
18 A. All the packages that was cited should be
19   installed were installed.
20 Q. Are you sure?
21 A. I'm sure that everything in it to build the
22   system was installed. So this is what I am
23   sure of. It was working. Since I did not
24   do it by hand, I cannot be sure. But it
25   makes sense.

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1   (Exhibit 492 marked.)
2 Q. Exhibit 492 is another Web page from the
3   Android Web site that discusses downloading
4   the Android source code; is that correct?
5 A. This is the title.
6 Q. Do you recall seeing this page before?
7   MR. PETERS: Objection. Form.
8 A. Not off the top of my head. Maybe, yes.
9   Maybe, no. I'm not sure.
10 Q. On the top of page two, it has in green a
11   repo command to download Froyo source code,
12   and that is the same as the command that you
13   listed in paragraph 25 of your report; is
14   that correct?
15 A. It is the same.
16 Q. Do you know what gets downloaded to your
17   computer when you run this command?
18 A. Most of that SDK. This is SDK. There is
19   multiple layers of downloading it. This is
20   the initial one. There are additions to it
21   to make it functional.
22   I want to correct myself. I did not
23   see this key before. There is a key on the
24   end of page two that you have to copy. I
25   did not see it before. So I am sure I did

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1   not see this page before.
2 Q. This appears to be the Web page that
3   explains how to download the Android source
4   code and verify that it was downloaded
5   correctly; is that correct?
6   MR. PETERS: Objection. Form.
7 A. Maybe. I did not see it before. We've been
8   using this [indicating]. This was
9   sufficient for us.
10 Q. You are referring to Exhibit 491?
11 A. I am referring to 491, yes.
12 Q. Does 491 provide the repo address that you
13   reference in paragraph 25 of your report?
14 A. (Witness reviewing document).
15   I don't see it. Let me see. (Witness
16   reviewing document.)
17   No. This is why it was explicitly
18   stated in my report.
19 Q. Where did you get that cite instruction
20   from?
21 A. This one [indicating]?
22 Q. Yes.
23 A. Seeon did it before me. I don't know where
24   he get it from.
25 Q. How do you know that this is the correct

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17 (Pages 62 - 65)

1 Q. But if copy-on-write is disabled, it would
2   just be a waste of memory to load these into
3   preloader?
4 A. Yes.
5 Q. And it might be more sensible to simply
6   launch the specific classes that are needed
7   when an application that needs them is
8   loaded into memory; is that correct?
9 A. Yes.
10 Q. So, for example, if you had a text messaging
11   application and it needed 15 of these
12   classes to run, it would make sense to just
13   launch the text messaging application, load
14   just those 15 classes into memory; is that
15   correct?
16   MR. PETERS: Objection. Form.
17 A. Not exact.
18 Q. What do you mean?
19 A. You don't need to load anything if you don't
20   have anything for it. You just load it on
21   demand when you need it. It loads
22   automatically. You don't have to give a
23   list of anything. If you don't have any
24   kind of -- something is preloading into your
25   system, there's no need for you to preload

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1   it.
2 Q. But it doesn't make sense to preload it
3   ahead of time unless you are using
4   copy-on-write; is that correct?
5   MR. PETERS: Objection. Form.
6 A. The preloading is effective with the
7   copy-on-write.
8 Q. So without copy-on-write, it would make more
9   sense to preload on demand?
10   MR. PETERS: Objection. Form.
11 A. Without copy-on-write, correct.
12 Q. And within my example of the text messaging
13   application, if it used some classes only in
14   certain instances, you may not even need to
15   load those classes until they were actually
16   needed by the text messaging application?
17   MR. PETERS: Objection. Form.
18 A. Correct.
19 Q. So if Android were to implement the code to
20   not use copy-on-write, it might make sense
21   to simply load class files on demand; is
22   that correct?
23   MR. PETERS: Objection. Form.
24 A. Yes.
25 Q. Did you try an implementation that would

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1   work that way?
2   MR. PETERS: Objection. Form.
3 A. What for?
4 Q. Well, you wrote an application that loaded
5   all of these classes, but with copy-on-write
6   disabled; is that correct?
7 A. To show the difference.
8 Q. But would it make sense for Android to
9   actually implement it this way?
10   MR. PETERS: Objection. Form.
11 A. Doesn't matter. It was not the purpose
12   to show -- to demonstrate the way -- to
13   demonstrate the value that can be given from
14   copy-on-write if you are using more of the
15   library loaded. When you find out if you
16   have point one seconds per application
17   currently, because I don't use much --
18 Q. Right.
19 A. -- and I want to show what happens if an
20   application will use much more. I take the
21   position that if use everything, which is
22   the maximum, when you use everything listed
23   now, in the future it might be a larger list
24   that can utilize much more time saving.
25   It's valid. And I just want to demonstrate

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1   the potential. I want to say this is
2   typical, or this is the potential for saving
3   application. The application becomes more
4   complex and will save more. The application
5   become more complex, it would save more.
6   Those applications are very -- and the
7   saving is not significant, .1 second per
8   application. It's nice. It's not
9   significant. It can reach a few seconds per
10   application, and then it's very significant.
11 Q. So in short, your performance test is just
12   to show the difference with and without
13   copy-on-write?
14 A. Yes. To show the potential of saving.
15 Q. But if Android was implemented without
16   copy-on-write, they certainly wouldn't do it
17   this way because it would be more efficient
18   to simply load the classes on demand; is
19   that correct?
20   MR. PETERS: Objection. Form.
21 A. I will refer you -- I will repeat what I was
22   saying before. I wanted to show what will
23   happen when application when used more --
24   not much more of this. Now, technically,
25   they can use everything. That's the maximum

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23 (Pages 86 - 89)

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1        C E R T I F I C A T E
2
3  COMMONWEALTH OF MASSACHUSETTS
4  MIDDLESEX, SS.
5
        I, Jill Shepherd, Notary Public, in
6  and for the Commonwealth of Massachusetts,
7  do hereby certify that:
        EREZ LANDAU, the witness whose
8  deposition taken on September 14th, 2011 is
9  hereinbefore set forth, was satisfactorily
   identified by means of driver's license, and
10 was duly sworn by me, and that the foregoing
11 transcript is a true and accurate record of
   the testimony given by such witness and such
12 testimony is a true and accurate
13 transcription of my stenotype notes to the
   best of my knowledge, skill, and ability.
14    I further certify that I am not
15 related to any of the parties in this matter
   by blood or marriage and that I am in no way
16 interested in the outcome of this matter.
17    IN WITNESS WHEREOF, I have hereunto
18 set my hand and notarial seal this 14th day
19 of September, 2011.
20
21
22        _____
23        Jill Shepherd, RPR
24        Notary Public
25 My Commission expires:  April 18, 2014
                                         Page 110
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1     I declare under penalty of perjury
2  under the laws that the foregoing is
3  true and correct.
4
5     Executed on _____ , 20___,
6  at _____, _____.
7
8
9
10    _____
11        EREZ LANDAU
12
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29 (Pages 110 - 113)